DURHAM
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CITY OF MEDICINE

CITY OF DURHAM | NORTH CAROLINA

Date: May 3, 2016

To: Thomas J. Bonfield – City Manager

Through: W. Bowman Ferguson – Deputy City Manager

From: Marvin G. Williams – Director of Public Works

Subject: Authorization of Agreement with the U.S. Geological Survey for the Study of Urban Stream Nutrient Loads and for Development of Recommended Monitoring Methods for Durham, NC City Streams (Item # 11109)

Executive Summary

The City of Durham is subject to three nutrient management strategies, the Neuse River Estuary, Jordan Lake, and Falls Lake. Public Works monitors nutrients in local creeks and rivers to assess cumulative changes to nutrients (and other pollutants) due to changes in stormwater and wastewater programs, installation of stormwater control measures, and other voluntary actions. Public Works uses monitoring data to estimate the mass of nutrients leaving the city, or the nutrient load. Past estimations of nutrient loads have included large uncertainty, up to 95% or more. Methods to reduce this uncertainty are needed so the city will have better information regarding the cumulative effectiveness of stormwater and wastewater programs, and stormwater control measures.

This project is broken into two phases. In the first phase, the U.S. Geological Survey will evaluate the monitoring and analysis the city has conducted, design an alternate monitoring program to reduce load estimation uncertainty, and execute this monitoring program. In the second phase, the U.S. Geological Survey will calculate loads using a variety of methods and make recommendations to the city regarding more effective monitoring to produce less uncertain load estimates. The first phase of the project is anticipated to be completed in 15 months. The total cost for Phase I is $140,000.00 with the U.S. Geological Survey contributing $50,000.00 and the City of Durham contributing $90,000.00. The total cost for Phase II is $100,000.00 with the U.S. Geological Survey contributing $45,000.00 and the City of Durham contributing $55,000.00. Phase II would not be funded before fiscal year 2018. The total project cost is $240,000.00, with the City of Durham contributing $145,000.00.

Recommendation

The Administration recommends that the City Council authorize the City Manager to execute an agreement with the U.S. Geological Survey for the study of urban stream nutrient loads and for the development of recommended monitoring methods for Durham

City streams at a cost to the City of $145,000.00 and a cost to USGS of $95,000.00 for a total project cost of $240,000.00.

Background

The City of Durham continues to be regulated by the Neuse River Estuary, Jordan Lake, and Falls Lake nutrient management strategies. Public Works monitors nutrients in City streams and river in order to determine locations with excessive concentrations of nutrients, and to determine nutrient loads delivered downstream to lakes/reservoirs. Measurements of nutrient load from streams provide information regarding the effectiveness of programs implemented citywide, such as the illicit discharge programs, dry weather storm sewer screening, industrial inspections, and public education. These programmatic measures are intended to reduce many types of pollution, including nutrients, and are difficult to measure individually. Measurements of nutrient loads from streams also account for structural stormwater control measures, such as constructed wetlands.

Monitoring nutrient concentrations (measured as mass per volume) assists the City in identifying nutrient sources that may be controllable. Nutrient loads (measured as mass per time) are used to measure the nutrient contribution to regional lakes/reservoirs. To estimate a nutrient load, both concentration and discharge data are needed. Public Works calculates nutrient loads at locations where the U.S. Geological Survey has co-funded discharge monitoring in the City. There are currently five such locations in the City of Durham. When daily discharge is available, monthly water quality samples from the same or a nearby location are used to calculate the nutrient load. Past calculations of load have yielded uncertainty of 95% or more.

The ideal method to determine nutrient load is to collect a nutrient sample every day of every year. With approximately 25 water quality monitoring sites a year and analyzing a nutrient sample every day of the year, the laboratory cost would be approximately $538,375.00. The cost per site would be $21,535.00. This total laboratory cost is based on current contract laboratory costs for nitrogen oxides ($12 each), organic nitrogen + ammonia ($32 each), and total phosphorus ($15 each). With the current monthly monitoring program of twelve samples collected a year at each monitoring site, laboratory costs are approximately $17,700 for nutrients. Assuming internal labor would complete the additional sampling, labor hours could increase from approximately 369 per year to 11,224 per year. Using automated sampling equipment could reduce the labor hours for daily sampling by up to 25%, assuming normal wear and tear on the equipment and no loss of equipment due to theft or vandalism.

This project seeks to evaluate the current monitoring strategy and to develop an alternative monitoring strategy designed to minimize the large uncertainty in load estimates. The project is scoped in two phases. During the first phase, the U.S. Geological Survey will review existing monitoring data from the City of Durham, the NC Division of Water Resources, and the Upper Cape Fear River Basin Association, and will also review past load calculations performed by the City of Durham. The U. S. Geological Survey will use information from this review to design an alternative

monitoring strategy with the purpose of estimating nutrient loads with more statistical confidence, and then it will implement this alternative monitoring strategy in Third Fork and Ellerbe Creeks. In the second phase of the project, the U.S. Geological Survey would use software to calculate the nutrient loads resulting from the alternative monitoring strategy in Third Fork and Ellerbe Creeks. A variety of nutrient load estimation methods will be evaluated. In the final project report, the U.S. Geological Survey will recommend changes to the City's monitoring program to achieve more accurate nutrient load estimates. The report may also recommend different methods to estimate nutrient load.

Issues/Analysis
The City is subject to three nutrient management strategies. For each of these strategies, a different nutrient reduction goal is specified. The currently monitoring program provides nutrient loads with a high level of uncertainty. The level of uncertainty year to year makes it difficult to ascertain the effectiveness of the strategies the City has employed to achieve nutrient reductions. This may result in the City not receiving credit for the programmatic actions it has employed and may result in the City investing in reduction strategies that are not optimally effective.

Alternatives
The alternative is to not authorize the execution of this agreement. The nutrient load estimates produced with the current monitoring program, with the associated high degree of uncertainty, would continue to be used by the City. This would make it difficult to evaluate nutrient reduction progress city-wide due to the significant uncertainty surrounding the City's nutrient load estimates.

Financial Impact
This project is budgeted for in the Public Works Operating Budget from the following accounts in the years specified:

Year	Account	Amount
FY2016	5500L041 728600	$90,000.00
FY2018	5500L041 728600	$55,000.00

The U.S. Geological Survey will provide funds of $95,000.00 for a project total of $240,000.00.

SDBE Summary
Not applicable

Attachments
Draft Study Proposal from U.S. Geological Survey
Draft Joint Funding Agreement